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Carriage and transmission of group B streptococci among STD clinic patients

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SUMMARY High rates of carriage of group B streptococci were found among men (38%) and women (42·3%) attending a clinic for sexually transmitted diseases. Swabs from the perineal/anorectal area gave the highest isolation rate and those from the urethra the lowest. The subpreputial sac was an important site for carriage of the organism, and there was a strong association between streptococcal isolation and balanitis. Of 92 couples studied, neither partner was colonised with group B streptococci in 36. In a further 36 one or other was colonised and in 20 both were colonised. Serotyping and phage typing showed that only three of these 20 couples were colonised with similar strains of the organism.

Introduction

Because of the importance of group B streptococci in neonatal sepsis and the relationship between maternal carriage and the early onset of infection[1] most work on the epidemiology of the organism has concentrated on women and babies. Until recently the lack of a suitable typing system hampered any epidemiological studies. The work of Stringer[2] on the phage typing of group B streptococci has remedied this situation. Very little attention has been paid to male carriage and the role of sexual transmission in the epidemiology of this organism.

Although group B streptococci are found in the female genital tract, the work of Kexel and Beck[3] and Easmon and co-workers[4] has suggested that the perineal skin may be the primary source of carriage rather than either the genital or gastrointestinal tract. Where different populations have been compared the carriage rates among patients attending sexually transmitted disease clinics have been among the highest.[5] This has raised the possibility that sexual transmission may play a part in its epidemiology. Weindling and co-writers[6] have recently shown that husbands and wives colonised by the organism carry identical serotypes and phage types.

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In this study we examined in detail carriage of group B streptococci in multiple sites in men and women attending a clinic for sexually transmitted disease (STD) and related carriage rates to the presence of a recognised STD. Using phage typing we also looked for evidence of transmission of the organism between sexual partners and attempted to relate this to the stability of the relationship.

Patients and methods

Patients attending a clinic for sexually transmitted diseases either for the first time or for re-examination were included in the survey. Samples for this study were taken after those for other routine diagnostic investigations. In male patients three plain cotton-wool swabs were used to sample the endourethra, the preputial sac (coronal sulcus in circumcised patients), and perineum. In female patients urethral, high vaginal, and perineal swabs were taken. In men and women who had a proctoscopic examination rectal swabs were substituted for perineal swabs. Sexual partners were identified later from the case notes.

SWABBING PROCEDURE

Swabs were incubated overnight at 37°C in Todd Hewitt broth supplemented with 0·5% (v/v) horse blood, gentamicin sulphate 4 mg/l, and nalidixic acid 15 mg/l. Subcultures were then made on blood agar and Islam's starch serum agar[7] and incubated anaerobically for 24 hours at 37°C using the Gaspak

system (BBL). Gram-positive catalase-negative organisms which produced haemolysis on blood agar or orange-yellow pigmentation on Islam's medium were serogrouped by the Streptex method (Wellcome Reagents). Group B streptococci were serotyped and selected strains also phage typed.

DIAGNOSIS OF STD

Neisseria gonorrhoeae was cultured on *Neisseria* isolation medium (Difco) supplemented with antibiotics. Oxidase-positive Gram-negative cocci were identified by fermentation and immunofluorescence reactions. Post-gonococcal urethritis was defined as a urethritis persisting seven days after treatment. Non-specific urethritis was defined microscopically as a mean minimum of 10 polymorphonuclear leucocytes/high power field with no microscopical or cultural evidence of a specific pathogen. Chlamydial cultures were not performed. *Gardnerella vaginalis* and *Trichomonas vaginalis* were diagnosed microscopically by the presence of clue cells and large numbers of small Gram variable bacilli and trichomonads respectively. *Candida* spp were diagnosed primarily by microscopy although in some cases growth was noted on the gonococcal isolation plates. Herpes genitalis was confirmed by the isolation of herpes simplex virus.

Results

Carriage of group B streptococci in male patients is shown in table I. Of the 132 patients sampled, 50 (37·9%) were carriers. Of these 50 men, 39 (78%) had positive results on perineal or rectal swabs or both. This combination gave the highest rate of positive results and was the only site of carriage in 11 men. No one site gave a positive result in all cases. Preputial and urethral carriage was lower in men with no clinical or microbiological evidence of STD. Non-specific balanitis and candidal balanitis were both associated with a higher isolation rate of group B streptococci from the subpreputial sac and urethra.

Female carriage of the organism is shown in table II. The overall carriage rate (69/163, 42·3%) was similar to that found for men. The proportion of positive results on perineal/anorectal swabs was,

TABLE I *Isolation of group B streptococci from various sites in men*

*Clinical findings and diagnosis**	*No of patients*	*Total No culture-positive (%)*	*No (%) of sites giving positive culture result:*		
			Urethra	*Subpreputial sac*	*Perineum (rectum)*
No abnormality	27	8 (29·6)	4 (14·8)	2 (7·4)	7 (25·9)
Clinical abnormality	105	42 (40·0)	27 (25·7)	31 (29·5)	32 (30·5)
Total	132	50 (37·9)	31 (23·5)	33 (25·0)	39 (29·5)
Post gonococcal urethritis	42	16 (38·1)	9 (21·4)	11 (26·2)	10 (23·9)
Gonorrhoea	29	10 (34·5)	7 (24·1)	6 (20·7)	8 (27·6)
Non-specific balanitis	20	12 (60·0)	10 (50·0)	11 (55·0)	10 (50·0)
Herpes genitalis and warts	17	7 (41·2)	5 (29·4)	5 (29·4)	5 (29·4)
Candidal balanitis	11	5 (45·5)	4 (36·4)	5 (45·5)	3 (27·3)

*Some patients had more than one condition

TABLE II *Isolation of group B streptococci from various sites in women*

*Clinical findings and diagnosis**	*No of patients*	*Total No culture-positive (%)*	*No (%) of sites giving positive culture result:*		
			Urethra	*Vagina*	*Perineum (rectum)*
No abnormality	33	15 (45·5)	6 (18·2)	7 (21·2)	15 (45·5)
Clinical abnormality	130	54 (41·5)	37 (28·5)	41 (31·5)	50 (38·5)
Total	163	69 (42·3)	43 (26·4)	48 (29·4)	65 (39·9)
G vaginalis infection	55	19 (34·5)	9 (16·4)	13 (23·6)	18 (32·7)
Gonorrhoea	36	16 (44·4)	10 (27·8)	11 (30·6)	14 (38·9)
Candidal infection	35	15 (42·9)	13 (37·1)	12 (34·3)	14 (40·0)
Herpes genitalis and warts	26	11 (42·3)	9 (34·6)	11 (42·3)	10 (38·5)
Non-specific vaginitis†	11	5 (45·4)	4 (36·4)	5 (45·4)	5 (45·4)
T vaginalis infection	11	4 (36·4)	4 (36·4)	4 (36·4)	4 (36·4)

*Some patients had more than one condition
†No herpes simplex, *G vaginalis*, *T vaginalis*, or candidal infection

however, rather higher (65/69, 94·2%). Urethral and vaginal carriage was generally higher in women with confirmed STD than in those who had no other detectable infection. The exception to this was *G vaginalis* infection, in which the urethral and vaginal carriage rates of group B streptococci were low.

SEXUAL TRANSMISSION

Ninety-two couples known to have had sexual intercourse together were studied. If an individual had more than one partner each of the relationships was regarded as "a couple" for this study. In 56 of the 92 couples either one or both partners were colonised with group B streptococci (11/56 men, 25/56 women, 20/56 both partners). Isolates of the organism from 18 of the 20 couples where both partners were colonised were serotyped and phage typed. In only three of these couples did serotyping and phage typing suggest that sexual transmission could have taken place (table III). There was no association between the stability of the relationship and the finding of identical serotypes and phage types in sexual partners.

Discussion

Direct comparisons of carriage rates of group B streptococci in different surveys are often difficult because of variations in sampling methods and bacteriological techniques. Several studies have shown that colonisation by the organism is very high among those attending clinics for sexually transmitted diseases.[5 8] Our female carriage rate of 42·3% was similar to that of 37·6% reported by Embil and co-workers[5] and that of 36·1% by Finch and co-workers.[8] Although this high carriage rate in women and the equally high rate in men might suggest sexual transmission of the organism, this was not substantiated by a more detailed investigation of the 92 couples studied. Whereas in 56 (60·9%) of these the organism was isolated in one partner, in only three (5·3%) were both partners colonised by identical serotypes and phage types. This occurred despite the sampling of multiple sites, the use of broth enrichment techniques, and the search for more than one type at each site.

Weindling and co-workers[6] have shown that family groups in general and husbands and wives in particular tend to be colonised with group B streptococci of the same serotype and phage type. Although their sample population was a similar size to our own, many of the couples whom we studied would not have had stable relationships. We did not, however, find any link between such stability and colonisation with the same organism. Colonisation with one strain may prevent further colonisation with different strains.

The primary site of colonisation is not known. Claims have been made for the genital tract,[1] gastrointestinal tract,[9] urethra,[10] and perineum.[4] In both men and women the organism was isolated more frequently from perianal/rectal swabs than from material from either the vagina in women, the subpreputial sac in men, or the urethra in both. In men the distribution of the organism among the three sites was more even than in women, where rectal/perineal colonisation was found in 65 of the 69 carriers. Although we did find more than one serotype in the

TABLE III *Phage types and serotypes in 18 couples in which both partners were colonised with group B streptococci*

	Men		*Women*	
Couple No	*Serotype*	*Phage type*	*Serotype*	*Phage type*
			Ic	N/T
1	II R	N/T	III R	12
2	Ic	N/T	Ic	17 18 26 29
3	III R	12	Ic	17 18 26
4	Ic	15 18 19 26 28 29	Ic	17 18 26
5*	Ic	15 18 19 26 28 29	Ic	15 18 19 26 28 29
6	II R	N/T	II	12 13 14 16 30 31
7	III R	12	III R	27 31
8	II R	N/T	III R	12
9	II R	12 16 17 20 24 28 29	III R	27 31
10	II	20	II R	12 20
11*	Ic	15 17 18 19 26 28 29 30	Ic	15 17 18 19 26 28 29 30
12*	II/Ic	N/T	I/Ic	N/T
13	III	N/T	R	7 12
14	II/Ic	7 12 20 26 29 30	Ia	15 17 18 19 26 28 29 30
15	N/T	3 8 14	Ic	3 14
16	II/Ic	7 12 20 26 29 30	Ia	15 17 18 19 26 28 29 30
17	II/Ic	N/T	R	1 12 27 31
18	II R	7 12 27 31	R	1 12 27 31

*Likely sexual transmission of group B streptococci
N/T = not typeable

same individual (both in a single site or in different sites) this was not common.

The only strong association found was between the isolation of group B streptococci and balanitis, in which 12 (60%) of the 20 cases carrying the organism in the urethra or subpreputially. This association merits further investigation.[11] Because of the small numbers involved, the importance of other observations such as the lower carriage rates in women with infections due to *G vaginalis* or *T vaginalis* and in men with gonorrhoea uncomplicated by postgonococcal urethritis is impossible to determine. Christensen and co-workers[12] found that the carriage rate was higher in those with gonorrhoea while Wallin and Forsgren[13] and Embil and co-workers[5] did not.

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